The Response of Tropospheric Ozone to ENSO in Observations and a Chemistry-Climate Simulation

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The El Nino-Southern Oscillation (ENSO) is the dominant mode of tropical variability on interannual time scales. ENSO appears to extend its influence into the chemical composition of the tropical troposphere. Recent results have revealed an ENSO induced wave-1 anomaly in observed tropical tropospheric column ozone. This results in a dipole over the western and eastern tropical Pacific, whereby differencing the two regions produces an ozone anomaly with an extremely high correlation to the Nino 3.4 Index.

We have successfully reproduced this result using the Goddard Earth Observing System Version 5 (GEOS-5) general circulation model coupled to a comprehensive stratospheric and tropospheric chemical mechanism forced with observed sea surface temperatures over the past 25 years. An examination of the modeled ozone field reveals the vertical contributions of tropospheric ozone to the column over the western and eastern Pacific region. We will show targeted comparisons with observations from NASA's Aura satellite Microwave Limb Sounder (MLS) and the Tropospheric Emissions Spectrometer (TES) to provide insight into the vertical structure of ozone changes. The tropospheric ozone response to ENSO could be a useful chemistry-climate model evaluation tool and should be considered in future modeling assessments.